US-China Education Review, ISSN 1548-6613
January 2011, Vol. 8, No. 1, 110-117

A Sample Science Education Activity in Multicultural Environment

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In this study, a sample activity developed in the workshops called "Science education in multicultural environment" of the program "Integrative teaching in multicultural environment" was presented. Workshops about varied subjects were carried out by participants representing four countries and participants developed teaching materials by getting benefit from elements special to their cultures in the ones related to science teaching. Two students from Belgium, one student from Denmark, one student from Latvia and five students from Turkey participated in the study and three Turkish academicians conducted the workshops. The outcomes of the study were evaluated by presenting them to all participants. The workshops were designed to help students learn instructional strategies and draw upon their prior learning experiences in order to apply effective multicultural education teaching activities. Emphasis is also placed on understanding the varied backgrounds and needs of students.

Keywords: multicultural education, multicultural environment, science activity, DNA model

Introduction

Communication and transportation facilities increased and became easier, in addition to this factor, trade, business, education, immigration and war made the togetherness of people from different cultures indispensable. Therefore, many countries have started to live with the concept of multiculturalism. These multicultural environments created some special features. In addition to its negative effects and many difficulties, there are positive effects of multiculturalism on social life. Similar effects are also being observed in education process. Studies were conducted about curriculum development, teaching method, techniques and teaching materials in order to overcome the problems in the educational process of multicultural environments (Barton, 2000; Moore, 2006).

> Multicultural education refers to equitable education for all students regardless of ethnic and cultural background, gender, race, color, religious affiliation or handicap, and implemented to enhance tolerance, respect, understanding, awareness and acceptance of self and others in the diversity of their cultures. (Irwin, 1999, pp. 38-44)

Johnson, Musial, Hall, Gollnick and Dupuis (2004) indicated that multicultural education is an educational approach that integrates 4 factors that encourage diversity and equality into a curriculum: the instruction of students from different backgrounds, the study of ethnic and other cultural groups, the development of critical thinking skills and a focus on human relations. Therefore, the awareness of pre-service teachers on

Some part of this article was presented at the ESERA (European Science Education Research Association) Conference, August 31st-September 4th, 2009, İstanbul, Turkey.

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multicultural education should be increased and curriculum should be developed in this manner.

Pre-service teachers enter teacher education programs with beliefs based on experiences with diverse populations that have influenced their "ways of thinking about teaching learners who are diverse" (Milner & Smithey, 2003). However, pre-service teachers are often hesitant to participate in discussions about diversity, inequity and stereotypes (Cochran-Smith, 2001; Horm, 2003). For pre-service teachers with little cross-cultural knowledge or experience, they often bring to their teacher education programs attitudes and beliefs that will negatively impact the diverse students they teach (Horm, 2003; Sleeter, 2001; Townsend, 2002). In order for teachers to be effective with diverse students, it is crucial that they first recognize and understand their own worldviews; only then will they be able to understand the worldviews of their students (Bennett, 1993). Researchers assert that in order for teachers to interact effectively with their students, they must confront their own racism and biases (Banks, 1994; Gillette & Boyle-Baise, 1995; Nieto & Rolon, 1995), learn about their students' cultures, and perceive the world through diverse cultural lenses (Banks, 1994; Gillette & Boyle-Baise, 1995; Nieto & Rolon, 1995; Sleeter, 1992; Villegas, 1991).

The concept of diversity is a complicated issue that needs to be addressed in teaching, learning and research. Science educators acknowledge that preparing teachers and working with teachers to teach science in urban schools for culturally, linguistically and ethnically diverse students are challenging tasks (Barton, 2001; Lee, 2003). Luykx, Cuevas, Lambert and Lee (2005) stated that challenges may involve teachers' "resistance" to teaching for diversity due to lack of knowledge or feelings of inadequacy or lack of preparation integrating nonmainstream students' languages and cultures into instruction. For pre-service teachers to understand the complexities of teaching science in urban schools, part of this means understanding their views of diversity, science and teaching diverse learners. In other words, teachers are expected to have the knowledge and skills to relate to many cultures and understand student diversity. Therefore, the aim of this study was to answer the question "How can we develop a science educational activity which will change so-called multicultural problem into an advantage in a classroom consisting of the students from different countries".

Method

In this study, action research methodology was used. The project was conducted in two weeks. There were several educational activities in the project; the activity that the science group followed was one of those activities. Before conducting those activities, all participating group followed presentations regarding several topics and the topics are presented below:

(1) The effects of instructional technology on multicultural environment;
(2) The effects of sport education on cultural and intercultural interaction;
(3) The effects of multicultural environment in special education practices;
(4) The role of national and universal values on multicultural environment;
(5) Intercultural interaction on science and technology development;
(6) Effects of language on cultural and multicultural environment;
(7) Citizenship education on multicultural environment;
(8) Development of instructional curricula for multicultural environment.

The presentations were carried out in 3 days. After presentations, workshop groups were formed. The researchers presented 4 topics related to multicultural science education to the science group students and they selected one from the following topics:

(1) How can an effective science education be designed by considering both intercultural interactions and developments in science and technology;

(2) How can we develop a science educational activity which will change so-called multicultural problem into an advantage in a classroom consisting of the students from different countries;

(3) Develop an activity which requires distance education and which will help students from different countries contribute each others' science education;

(4) Plan a project for students participated in INTIMETS (integrative teaching in multicultural environment for teacher students) project by considering our discussion topic when you go back to your countries.

The science group which was composed of pre-service teachers from different countries and subject areas decided to work on the second topic presented above. Then, workshops had been carried out by the researchers and the students. The science group worked on the topic for 16 hours.

In the workshop 1 (October 17th, 2008), science group met and introduced themselves to each other. Moreover, they decided on which topic they want to work on and tried to understand what they are going to do in the process. The workshop carried out in 3 hours.

In the workshop 2 (October 17th, 2008), science group made a literature review and studied on articles found in literature review. They listed advantages and disadvantages of a multicultural environment. The workshop carried out in 3 hours.

In the workshop 3 (October 20th, 2008), science group developed activities that can change so-called disadvantages to advantages after conducting discussions. In addition, researches conducted some activities so that students had a chance to realize how they can teach in a multicultural environment. The workshop carried out in 5 hours.

In the workshop 4 (October 21st, 2008), science group prepared their products (a poster and DNA (deoxyribonucleic acid) model). The workshop carried out in 5 hours.

In the presentation (October 23rd, 2008), science group presented their workshop outcomes to all the participating students and instructors.

Sample

The sample was composed of students enrolled in the INTIMETS (2008) project in the frame of ERASMUS (European Region Action Scheme for the Mobility of University Students) program. The first stage of the project was conducted at Faculty of Education, Sakarya University in Turkey, October 13th-24th, 2008. There were 8 students both from Belgium and Denmark, 10 from Latvia and 15 students from Turkey in the project group. In addition, three instructors from Belgium, Denmark and Latvia and 16 from Turkey contributed to the project. In our sample, there were two pre-service teacher students from Belgium, one from Denmark, one from Latvia and five from Turkey. The major of the students were primary education, physical education, special education, social science studies and computer and instructional technology.

Workshops

Participants of the science group cooperated to work on the selected topic. They made a literature review in order to understand what multicultural education is and what are the advantages and disadvantages of multicultural environment. Since the group itself was multicultural, participants used their own experiences in

this process to investigate the advantages and disadvantages of teaching in multicultural environment. They designated advantages and disadvantages of multicultural environment (see Table 1).

Table 1

Advantages and Disadvantages of Multicultural Environment

Advantages	Disadvantages
• may learn language from other countries • may learn other cultures • may use the knowledge from other countries • may learn much more values • may break down the stereotypes	• may loose your own language • new stereotypes may formed • when there are a lot of people from other countries, the success of the class will go down • the unity of a city or country can not be keep save

They discussed how these disadvantages can be changed into advantages and proposed the following ideas:

(1) Respect the differences: While coming to that conclusion, for example, student A said, “Much culture (many cultures) divides peoples into groups, for example, here. When we go to lunch/dinner, we divide because they want to drink bear, they want to eat pig because of religion, because of culture this makes differences” and “I saw that different cultures… I saw a girl yesterday who cleaned her nose very noisy; in our culture, it is very disturbing and it is not normal think. We are always late but they are on time”.

Student E said that “We two are Belgium and we are not same, and you are Turks but again you are not same”.

In addition, one of the researches also contributed to discussion and said that, “We may say don’t generalize people. There is a huge diversity in nature for all the species. Because of this diversity, we have genetic diversities and the human beings may differ one to each other, that’s why the generalization may not be good I think”.

During their discussions, students highlighted that beliefs, culture, values and habits of students who are coming from different cultures will probably differ in multicultural environment. As an example, the speech sections of two students and a researcher is presented above. Other students also presented their views on this issue. After that, they have concluded that if students do not respect these differences, education in multicultural environment cannot be performed in a healthy manner. Students indicated that similar disadvantages that may arise in multicultural environment can be turned in to an advantage when we respect the differences. With the change of so-called disadvantage into an advantage, students will “learn the other cultures”, “learn much more values” and “break down the stereotypes”.

(2) Interaction with other cultures: One of the conclusions students come up with while they are discussing how pre mentioned disadvantages can be changed into an advantage was the idea of “interaction with other cultures”. Although students indicate that multicultural environments bring about probability of loosing own language and values as a disadvantage, at the same time as an advantage, people may learn new languages, share knowledge and technology by the increase of interaction among different cultures.

Some speech sections of students’ discussions are presented below while students are coming to that conclusion:

Student B said, “You can learn other languages, for example, I know ‘merhaba’ (hello)”. Moreover, student C indicated that, “We learn how to get together and how to respect each other. I can give an example about the USA. For example, the Indians are really good at computer programs and Japans people are really

good at technology on cars, they now live in USA together, they learned all from each other, that is why he USA is really good country took same as Ottoman Empire. That's why advantages multiculturalism more than disadvantages".

(3) Learn from each other, not about each other: The basic starting point for this conclusion of students was getting information about different cultures by direct interaction will be more accurate instead of getting information by indirect ways. A good example of this conclusion can be student D's statement, "... for example, I am Christian, the others are bad" in which he/she tried to stress the inappropriateness of assessing people without getting information about their religions or having insufficient knowledge, prejudice.

To eliminate problems that may arise due to getting information by indirect ways about people from other cultures, student E proposed the following idea and the others also supported this idea. Student E: "… when they do (communicate/interact), you have chance to solve problem, and it is not a problem anymore".

By the help of all these suggestions, they cooperated to develop science teaching materials. At the end of the project, they prepared poster and a DNA model. In the poster, participants presented examples in which elements special to their cultures were used for science teaching. These examples are:

(1) Yogurt and pickle (can be used while teaching fermentation, special to Turkey) (see Figure 1). The researches demonstrated how students can produce yogurt and pickle. After those demonstrations students made yogurt and pickle by themselves and the researchers explained how those production processes can be used in science education;

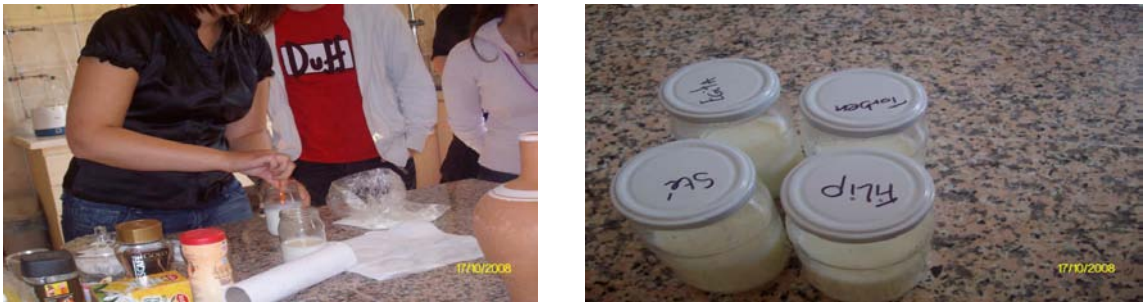

Figure 1. Fermentation of yogurt.

(2) Latvian cheese (can be used while teaching chemistry, special to Latvia). Student B with the statement "While we are teaching, we can use some special things from other countries… from Latvia, we can use Latvian cheese" indicated that Latvian cheese can also be used while teaching science after they have received information from researchers about how to produce yogurt and pickle;

(3) Toy block (can be used while teaching physics, special to Denmark). Student D with the statement "The roofs are flat in Turkey but in Belgium they are steeper. So with Lego you can rebuilt houses, you can poor water over it, then you can see what the water does, in flat roof water stays over it and in steeper roof water flows easy, so if you want to build new house, we want to teach children how houses are built, you can do experiments with Lego which is special to Denmark" indicated that Legos which are special to Denmark can be used for variety of purposes while teaching;

(4) Chocolate (can be used while teaching chemistry, biology special to Belgium). Student B with the statement "While we are teaching, we can use some special things from other countries like chocolate from Belgium…" indicated that chocolate which is special to Belgium can be used for variety of purposes while teaching.

At the end of the discussions, they decided to develop a material that can be used in multicultural environment for teaching science. While they are discussing on what the material should be, student A made the following suggestion "We can make a DNA model by haribo, Belgium chocolate, because they have different colors, we can say that there is letters like A, G, C and T, and if the name of country contains are of this letters, we can use something special in this country to represent bases of DNA. For example, T (thymine), Turkey starts with the letter 'T' so Turkish students can bring Turkish delight to put a DNA model or there is 'G' in Belgium, we can use Belgium chocolate and we can write the correspondence letter on these goods". All the group members agreed on that idea.

After that, they started to construct a DNA model. While developing the model, participating students used candies that they brought from their countries (see Figure 2). DNA is a double helix of two polynucleotide strands. Each nucleotide is composed of one of the 4 types of bases (guanine, cytosine, adenine and thymine), a deoxiribose sugar and a phosphate group. Each of DNA components was symbolized by using a character that belongs to one of the nations (see Figure 3). For example:

(1) Since the word Turkey contains the letter "T", they have used Turkish delight to represent thymine;

(2) Since the word Belgium contains the letter "G", they have used Belgium chocolate to represent guanine;

(3) Since the word Latvia contains the letter "A", they have used Latvian candy to represent adenine;

(4) Since the word culture contains the letter "C", they have used a common candy to represent cytosine;

(5) Since the word Denmark contains the letter "D", they have used Denmark candy to represent deoxiribose sugar.

Figure 2. Students are constructing the DNA model.

Figure 3. Students are preparing the poster.

At the end of the workshops, students come to the following conclusion: "Each DNA has a massage, the massage of our DNA model is although the participants come from different cultures, have different ideas, different characteristics, they all can come together to work in harmony for the same aim".

Finally, they presented what they have done in the workshops and workshop products to participating

students and instructors.

Conclusions and Implications

Culture is the way we think, feel and behave as a society. We are born into a culture and through socialization processes, we learn about our culture which ultimately represents our reality and our world view (Chinoy & Hewitt, 1975; Cruz-Janzen, 2000; Gollnick & Chinn, 2002). Although it is extremely important that children learn about their culture, it is also important for them to learn that not everyone is the same. This is especially important for children who live in a community that is not racially, ethnically or culturally diverse. Multicultural education is ideal in helping young children understand the lives of people who may look, dress, speak, think or eat differently from the way they do. Therefore, whether a classroom is monocultural or not, it is imperative that teachers provide multicultural materials and activities and allow students to be active participants in these activities. This helps prepare young children to meet the diversity that is inevitable (Midobuche, 1999; Manning, 2000; Salmon & Akaran, 2001).

Young children enjoy learning about different people and each other. An integrated program that includes multicultural activities and materials will help young children understand that their world is larger than their community (Salmon & Akaran, 2001). In a classroom that is heterogeneous, children have the opportunity to experience, at first hand, people who are different from themselves. However, it is different in a homogeneous classroom. In this type of classroom, the teacher has to make a determined effort to help children understand differences as they relate to them and the people with whom they may come in contact (Gayle-Evans, 2004).

Programs need to prepare teachers who can effectively instruct students of diverse backgrounds and cultures. A broader implication for teacher education programs is the need to prepare teachers who can teach all students to live and function in diverse communities and contribute to social prosperity at the national and global levels. The skills, attitudes and knowledge learned through multicultural education are important for all students. Teacher educators play an instrumental role in identifying and implementing appropriate strategies for realizing multicultural education objectives. To adequately perform their tasks, teacher educators must identify ways of assessing the effectiveness of the activities and programs they employ for actually promoting multicultural education aims (Pettus & Allain, 1999).

It is obvious that there would be many problems special to multicultural environment while teaching in such a medium (Moore, 2006). However, these problematic conditions also can supply new instruments for beneficial purposes, to enrich educational environment and for an alternative education. For example, one of the participating students from Belgium indicated that “The roofs in Belgium are steeper than the roofs in Turkey”. This can be a good example for teaching subjects related to pressure. That kind of examples can enrich teaching and learning process. In addition, the activities that are conducted in the workshops also increased the interaction and students had a chance to understand each other. The activities conducted became a good experience for students of realizing what would happen in a multicultural environment. They developed empathy of how their students can learn better and easily in multicultural environment. In other words, conducted activities helped students imagine what constitutes multicultural science education in content and pedagogy and it is a difficult thing to do since there are relatively few examples of what this looks like for students to model (Barton, 2000). With the increase of interactions between cultures, it is inevitable for both students and teachers to face with multicultural environments. Therefore, similar studies can contribute to the education of pre-service teachers for such circumstances.

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